

LPS Bulletin – Reliability

RI-C5 SHU-Feed Pre-heater tube leak 17-Nov-09



IPS Control:
1733108

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Most severe O₂ pitting on bottom tubes where condensate exits shell side of exchanger

Tenets of Operations

Violated:

6. Always maintain integrity of dedicated systems.

URIP

Design/Care/Fix/Prevent

Incident Description:

WHEN: November 17th, 2009

WHERE: Richmond

WHAT: C5 SHU Rx Pre-heater tube leak

SUMMARY: Area operators on the LPG area noticed a light olefin odor in and around the YDIB plant originating from an unknown source. Through intensive investigation, the source was determined to be coming from a likely tube bundle leak in E-901. As a result, operations initiated a shutdown of the SHU plant to mitigate the leak source.

Investigation Findings:

1. E-901 was discovered to be leaking internally to the condensate system and was vaporizing in the condensate flash vessel which ultimately vents to the atmosphere.
2. E-901 Internal inspection revealed a tube failure and allowed the higher pressure process to leak into the condensate. The original bundle (15 years service) was found externally pitted at the steam/condensate interface with extensive corrosion.
3. The external tube corrosion mechanism was related to oxygen pitting as the 150 steam is shell side inlet and condensate on the shell outlet. A low concentration of oxygen can always be present in the 150# steam header. Over time, this can lead to pitting in steam supplied equipment.

Lessons Learned/Business Practices:

1. The integrity of the BFW sources and monitoring of dissolved oxygen content is critical in mitigating oxygen concentrations in steam equipment. Mechanical deaeration as well as chemical treatment used to control oxygen levels in steam equipment are the only methods available to minimize this occurrence.
2. Existing BFW chemistry and deaerator operation is performing at acceptable levels. Original bundle has been in operation for 15 yrs without issue. Bundle life is acceptable for this process.
3. Original bundle design is not equipped with a non-condensable vent to remove oxygen from the shell side.

Recommendations/Actions Taken:

1. Four tubes were plugged and unit was placed back in service. 1/15/2010 - Tube bundle was replaced in-kind with new unit during planned Alky plant pit stop.
2. The cost of implementing a design change is greater than replacing the existing bundle every 15 years.

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